

Microvision Application Note:

Software Implementation
of

VESA
FLAT PANEL DISPLAY MEASUREMENT
STANDARD
“Suite of Basic Measurements”

Companion document to :

VESA's Flat Panel Measurement Standard Version 1.0

and

Microvision SS200 Series Manuals

VERSION 1.0
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January 19, 1999

VESA FPDM “Suite of Basic Measurements” software usage

About this Document

This document describes how to operate Microvision’s VESA FPDM software . It is intended to be a companion document to VESA’s Flat Panel Measurement Standard Version 1.0 and a supplement to SS200 series manuals.. This document describes how to properly setup your system prior to running the software and how to operate individual functions that constitute the VESA FPDM software . Theory behind each of the tests is covered in the VESA FPDM manual.. These tests have been implemented by Microvision to the best of our ability to produce the required test results as described in the standard.

Before you start

Before using this software, check the following:

- Have a working knowledge of SS200 series systems and software. Topics such as using the setup function that are explained in other manuals will not be explained here.
- To begin use of the test suite, the system must first be running version 1.59 or better. If new software is required, it can be requested from Microvision through our web site www.microvsn.com. Installation instructions can also be obtained from the web site in the appnotes section.
- Attach the Goniometric assembly to the stage and have its connector attached to the computer.(power off)
- Pattern Generator control of UUT. VESA software requires automated control of patterns on the UUT by any of the following methods:
 1. Internal pattern generator of SS200 series system.
 2. External pattern generator under serial control.
 3. Running mvremote on remote laptop under serial control.
- UUT placed on a suitable stand. In most cases the UUT will need to be elevated 6-12 inches such that the goniometer can access the lowest portion of the viewable area. The dimensions of the viewable area will be needed during Initialization.

About the Software

Software organization and operation

Microvision software is currently divided into two separate product lines, the SS200/210 and the SS220. SS200/210 products are dedicated to CRT analysis and SS220 for flat panel display. Because they both run from the same computer and hardware platform, it is possible to operate both of these products from the same computer. It is necessary though to restart the software when changing between products. It is the intent of Microvision to combine the functionality of these two systems into a single platform/program so that both types of data collection can be done within the same session.(no restart). As progress is made towards this goal, SS220 functions will begin to be moved into SS200/210 software and new SS220 functions will be added to the SS200/210 software without ever appearing in the SS220 software. The final result will be a SS230 software platform that supports all of Microvision's camera/hardware options with option selection handled as a mode change.

The VESA software is a new addition to the SS220 and thus will be added to the SS200/210 software platform. It will be accessed by placing the SS200/210 system into Goniometer mode. To run the pre-existing SS220 functions, the SS220 software must be re-started. A prompt will appear each time the system is powered up for selecting which software to run.

Note: Certain tests within the VESA software will require a mode change before they can be used. For example, Temporal or Response Time measurements will require that the camera head is changed to either a RTM mode or a OMM module with an integrated RTM camera. See the section on mode changes for instructions on changing modes.

Enabling the software and Mode Changes

The enabling of the software (changing modes) is done within the setup function of the main system screen. Some systems were delivered with an option to select either SS210/200 or SS220 software during boot-up. Please run the SS210/200 software before trying to enable this option.

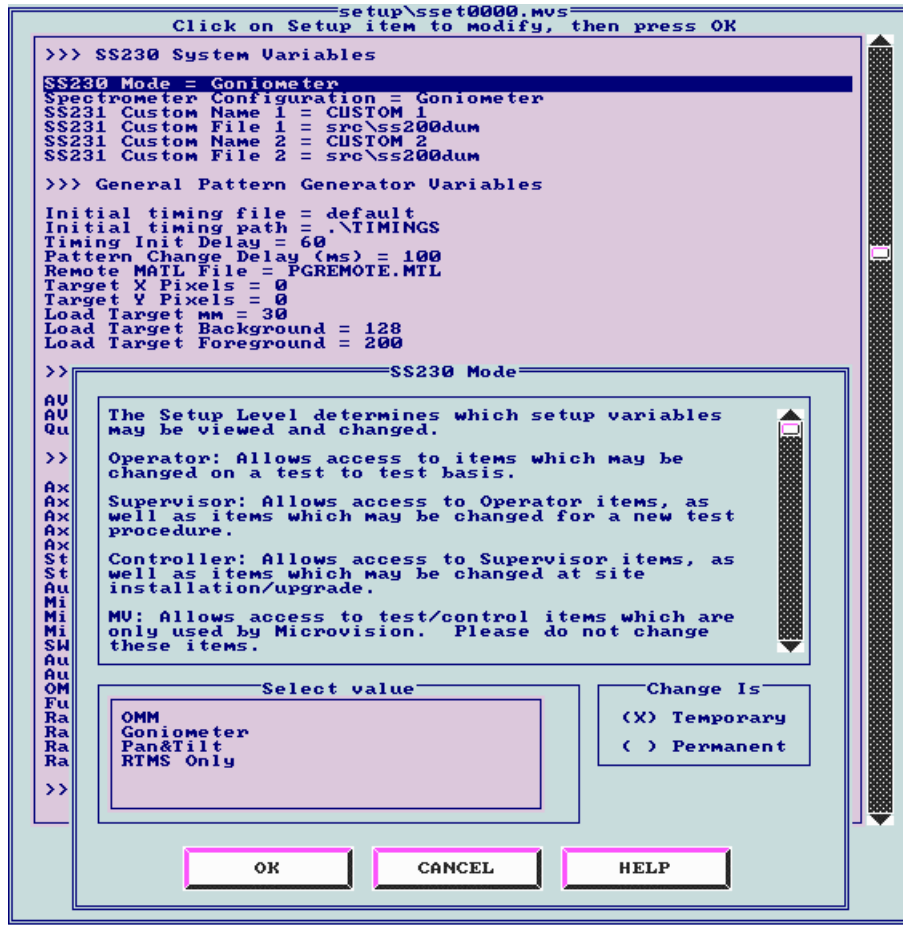
To enable the FPDM measurement software, you will need to enter into the main setup and change the following two variables, "Goniometer Version" and "SS230 Mode" as shown in the clips from the setup table. Both variables are located on the first page. If you have and are going to use the RTM module, you will also need to enter a RTM version number.

Set Goniometer Version = 100

Set RTM Version = 100

```
Lens Version = 103
Pattern Generator Version = 103
Positioner Version = 123
Spectrometer Version = 100
RTM Version = 100
Goniometer Version = 100
```

Setting SS230 Mode



Selecting the operating mode of the system from the main setup menu. Mode changes may be necessary to perform tests that require different hardware.

Operating Modes:

- **OMM** - CCD camera and spectrometer and optional RTM. (SS210) Select this mode to run Temporal or Response time measurements if you have an OMM with RTM installed.
- **Goniometer** - goniometric assembly with bench top spectrometer. Select this mode to run the majority of VESA tests.
- **Pan & Tilt** - not yet available
- **RTMS Only** - Stand alone RTM unit. Select this mode if you are going to use a stand alone RTM module to make Temporal or Response Time measurements.

Note: Most of the tests described in this document are run from Goniometer Mode. Tests that require a mode other than goniometer mode will note this.

Initializing the System - Do this Before Testing

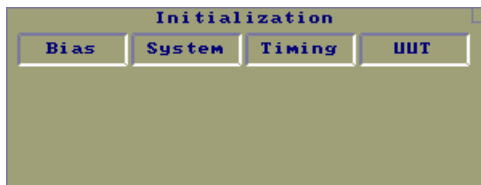
Before any testing is done on the panel the system needs to be initialized . Initialization will establish the following parameters:

- Home the roll and skew axii
- Perform a Bias/Dark current calibration
- Determine that the screen is properly under pattern generator control
- Locate the camera position in front of the panel
- Auto range to establish the proper working distance
- Seek the UUT center.
- Adjust panel perpendicularity

Running Init

The viewable area is also required for proper initialization. It is not determined automatically and must be entered at least once for each new panel type. Use the UUT initialization when changing panel types or using a panel for the first time.

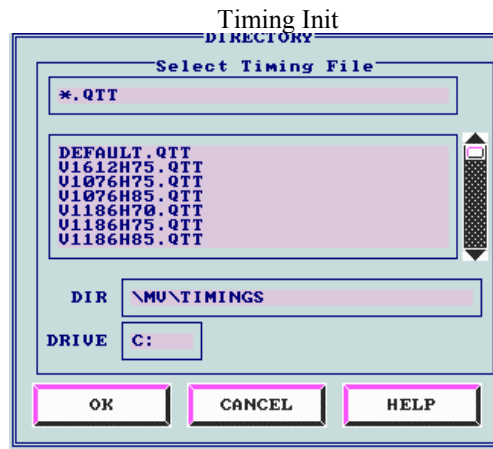
Enter the Initialization menu by clicking on the “Init” button in the upper left corner of the screen. There are four types of initialization:



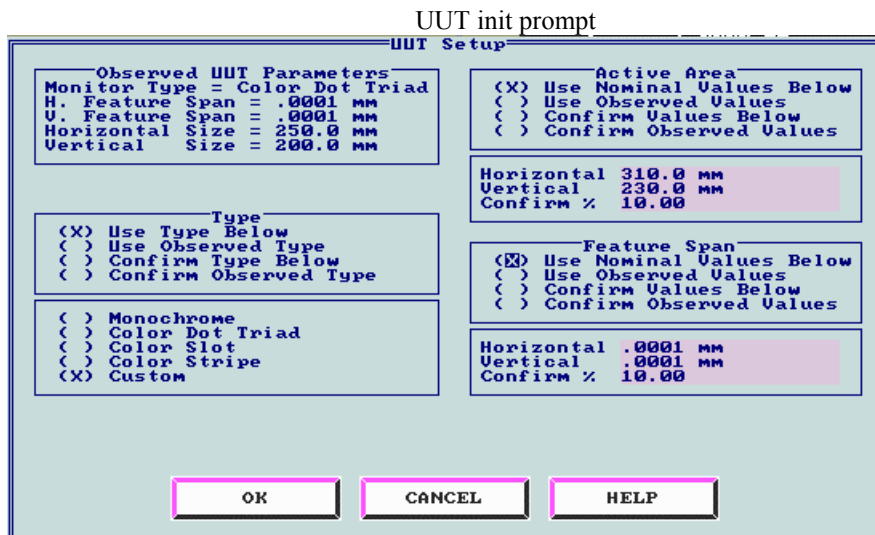
- Bias - Does not initialize but sets the bias/dark current only. Used to re-establish reference levels for low light level measurements.
- System - Performs complete initialization. Assumes that Panel size information has been entered using UUT function.
- Timing - Performs complete initialization with prompting to allow for timing file selection. The default timing file can be permanently saved through the main setup.
- UUT - Performs complete initialization with prompting for viewable area entry. The viewable area is required for proper initialization. It is not determined automatically and must be entered at least once for each new panel type. Use the UUT initialization when changing panel types or using a panel for the first time.

Only one initialization need be performed. The different methods are provided so changes to timings or panel specifications can be performed before the initialization begins.

Init Menu

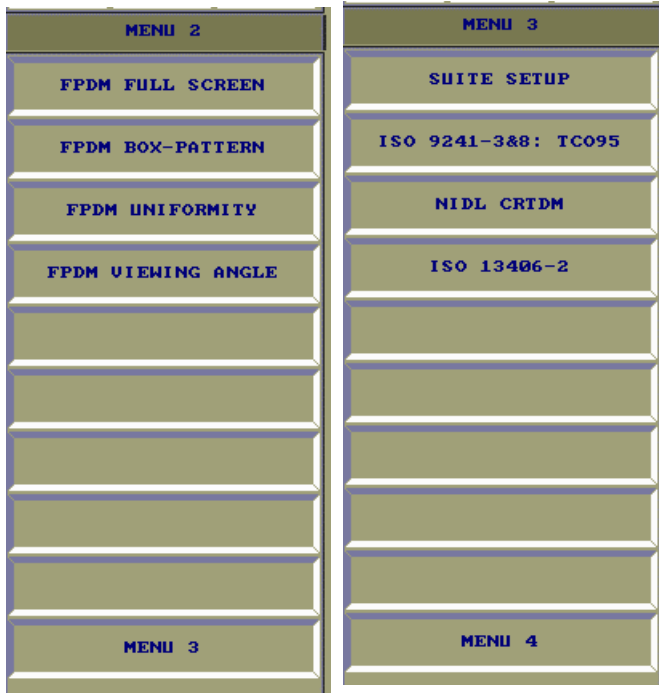


Timing file selection at the beginning of initialization. Timing files can be saved as the default in the main setup menu.



UUT initializations allows panel specifications to be entered prior to initialization. The above defaults are recommended. Only the horizontal and vertical Active area dimensions need to be entered.

Suite of Basic Measurements



When the software is started in goniometer mode (see Enabling the Software), the Microvision screen is seen on the display and lists the available functions. Each of the functions will be described in the following sections. These functions are accessed on the second menu and third function menus. The second menu contains the individual functions that comprise the suite. The third menu (reserved for automated test suites) is used to configure the VESA test suite for automatic operation. The “Suite Setup” button is used to setup the tests.

Data Reporting

All the tests that are performed by the VESA FPDM software suite will record the test results into a report file. The report files are stored in the default data directory as specified by the setup variable “Data Logging Directory” found in the main setup table. The names of the individual report files are accessed through the setup table associated with each function.

The Suite Setup function performs data reporting in a similar way but additionally records data to a log file. The log file is used for recalling data for later on screen viewing or can be imported into an Excel spread for customer specific processing. The report file generated by the Suite Setup function is a collection of the individual report files generated by each of the functions that make up the suite. The appended report files are identical to the reports generated when the functions are run individually.

```
>>> Data Logging Variables
Screen Dump = PCX 256
Screen Dump Driver = HP LaserJet
Report Port = LPT2
PCX File = MUDUMP00.PCX
Display Date/Time = Yes
Data Log Directory = DATA\
```

Main Setup variables for controlling
Data Logging

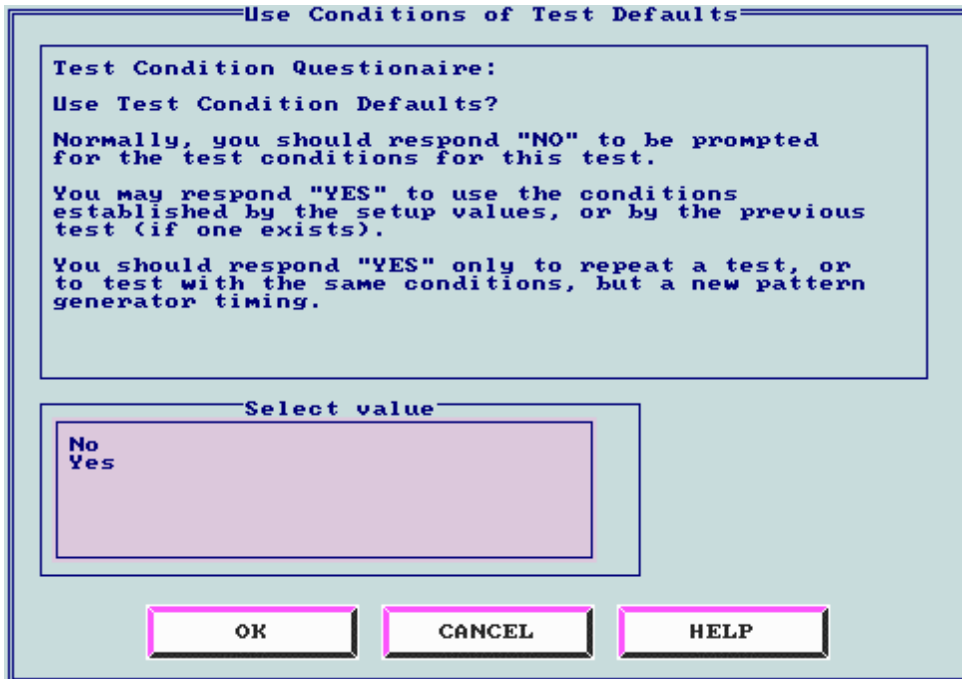
Suite Setup



A vertical menu titled "SUITE SETUP" with the following options: Real Time Display, Test Conditions, Test Selection, Display Setup, Run Tests, and Log = FPM00000.LOG.

Suite Setup is used for defining test sequences and for entering operator information relevant to a particular test; such as operator name, product number, etc. After a test sequence has been defined, the Run Tests function is used to execute the full test sequence with no operator interaction. The results from the test sequence are then recorded and saved into a log file. The name of this file can be selected by the user. The Suite setup function should be used only after all the functions have been evaluated on an individual basis to decide which ones to include in your test suite. **Suite Setup** can then be used to compose a test sequence that best suites the operators need.

Test Conditions



Use Conditions of Test Defaults

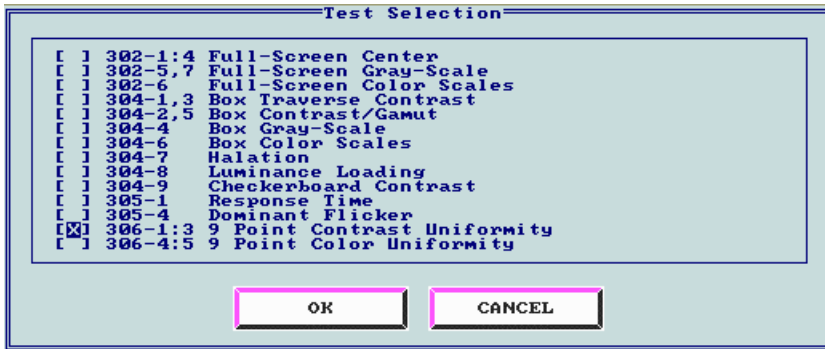
Test Condition Questionaire:
Use Test Condition Defaults?
Normally, you should respond "NO" to be prompted for the test conditions for this test.
You may respond "YES" to use the conditions established by the setup values, or by the previous test (if one exists).
You should respond "YES" only to repeat a test, or to test with the same conditions, but a new pattern generator timing.

Select value

No
Yes

OK CANCEL HELP

The **Test Conditions** function will prompt the operator to answer a series of questions that will be used in the report generation. These options can also be accessed through the **Setup** function

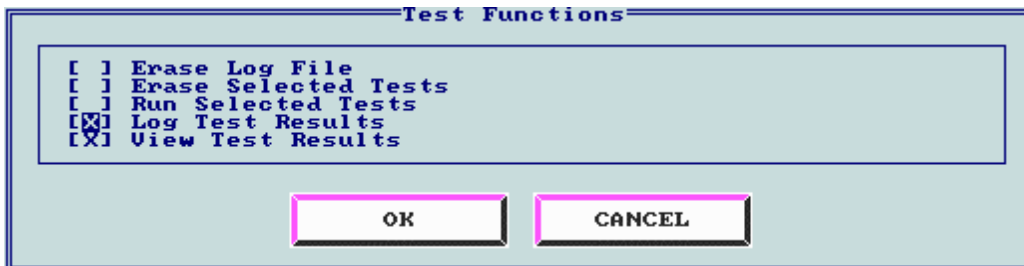


Test Selection is used to create the test sequence to be run. In the screen clip above, it can be seen that all the available functions are listed with a check box preceding them. A function is included in a test sequence if the box before it is checked.

Note: Not all of the tests listed may be available in the current mode setting. If a test is checked that will require a mode change, the system will inform the operator at run time.

Display Setup (Not currently used)

Run Tests



The **Run Tests** function is used to manage data collection and to begin a test sequence. Each time a test sequence is run, a log file is created. Data can either be added to an existing log file or a new one can be created. The log results of a previous data collection can also be view through this function without rerunning a test sequence. The log file name will be automatically incremented between tests if it is of the form "FPM00000.log". The specific options are:

- **Erase log file** - if checked, the entire log file will be erased prior to data collection.
- **Erase selected tests** - Erase data from the tests selected through the **Test Selection** function. Any other data in the log file will remain untouched.
- **Run Selected Tests** - Run the test that were selected in the **Test Selection** function.
- **Log Test Results** - Enable the logging of data. No data will be written without this option selected.
- **View Test Results** - Show the test results on the screen after data collection is complete.

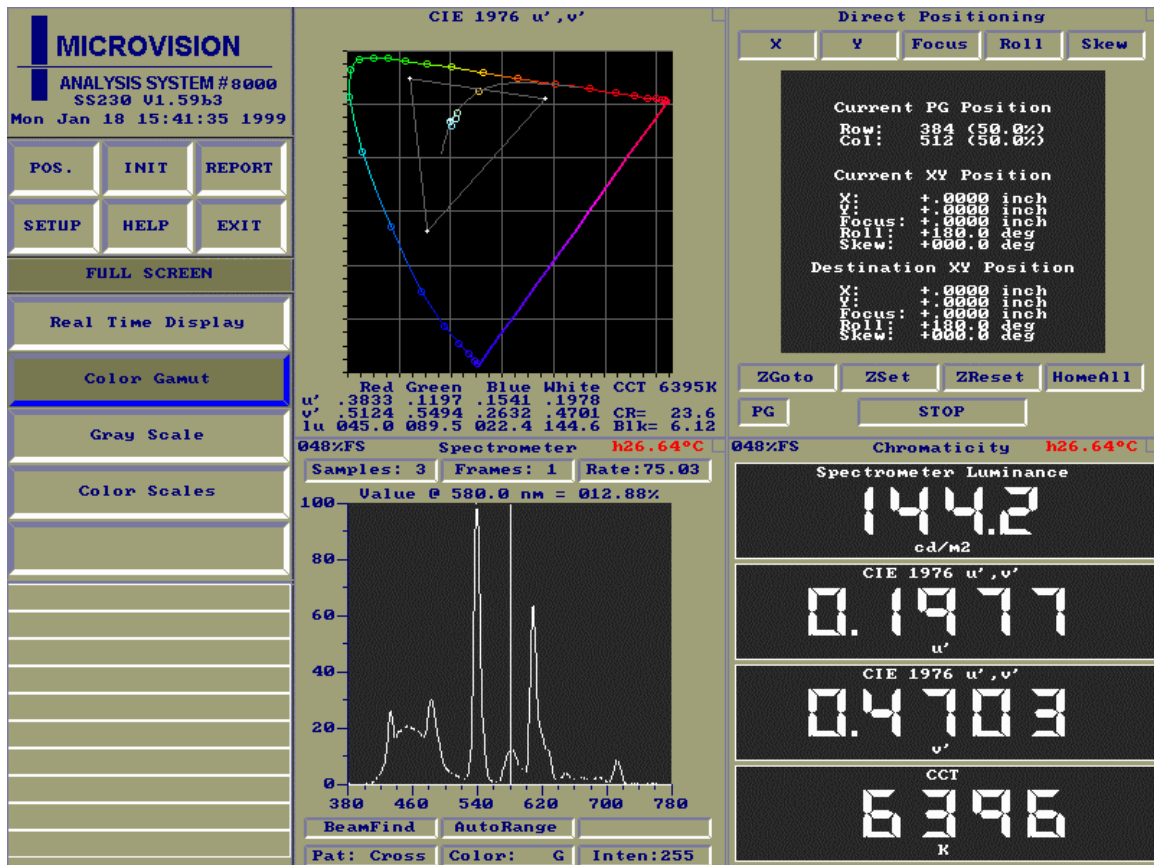
Note: If a test sequence is selected that will require a mode change to complete, the data from the previous mode is retained and the data from the new mode will be added to complete the report.

Full Screen: 302-1:7



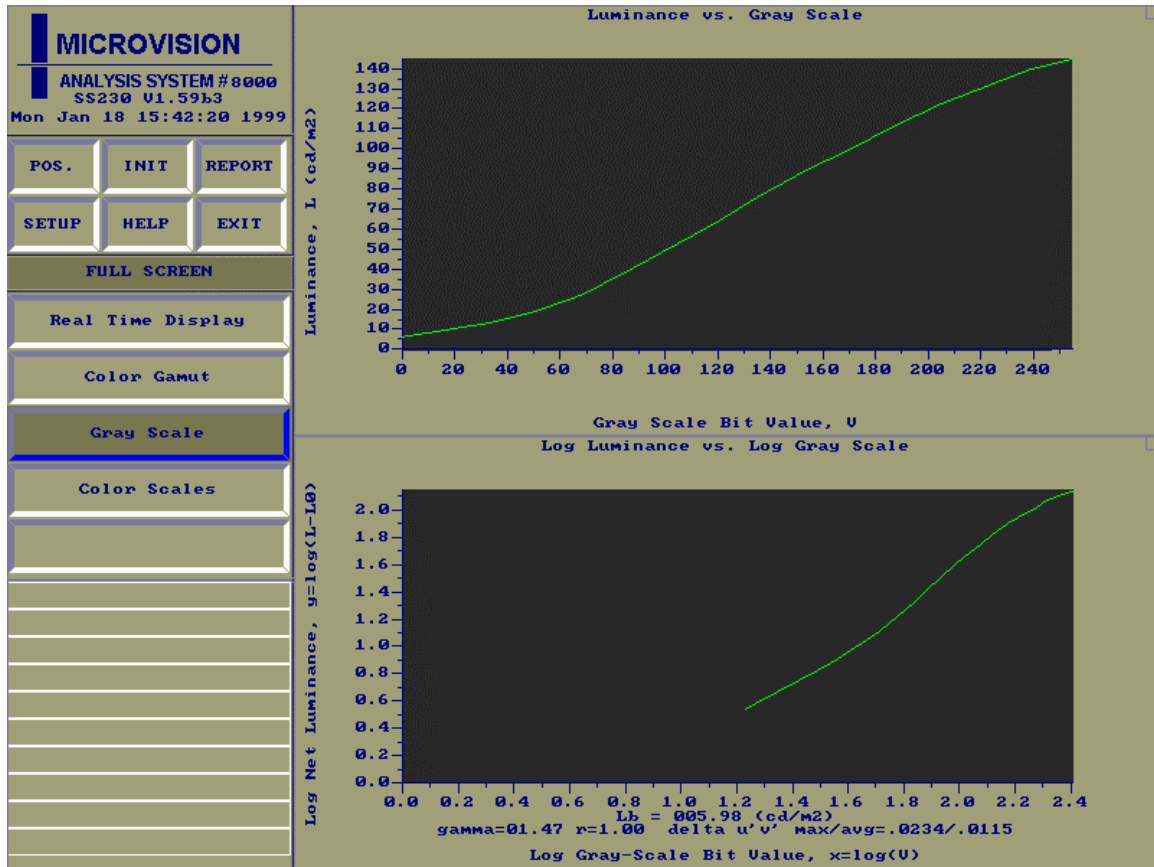
The **Full Screen** functions are measurements made on the center screen while a full-screen of white, black, or color are displayed. Because of the commonality between some of the tests they have combined into only a few functions.

Color Gamut 302-1:4



The **Color Gamut** function produces the above screen. The function will cycle through Red, Green, Blue, Black, and then finally White to generate the Gamut plot shown. Data is also recorded into a report file.

Gray Scale 302-5:7

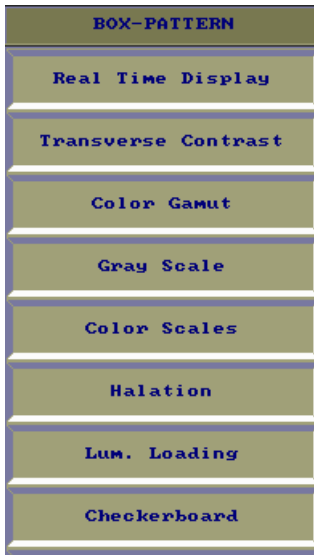


The **Gray Scale** function collects data by varying the drive level of a white screen. The result is the plot shown above. The number luminance levels used and the maximum level can both be set within the setup function.

Color Scales 302-6

The **Color Scales** function is similar to the Gray Scale function except that the luminance levels of Red, Green, and Blue are varied. The plot of the data is also similar to that of the **Gray Scale** function.

Box Pattern 304-1:9



The **Box-Pattern** functions refer to placing rectangular boxes on the screen and comparing one box with another, with background, or combinations of boxes.

Transverse Contrast 304-1,3

304-1,3 Traverse Contrast

Negative Video		
Position	Luminance	Contrast
Center	140.	
1	4.45	31.6
2	5.06	27.8
3	4.08	34.4
6	4.70	29.9
4	4.75	29.6
7	5.04	27.9
8	5.45	25.8
9	5.11	27.5
Average/EIAJ Contrast = 29.1/29.7		

The **Transverse Contrast** function will collect data from 9 locations on the screen and produce the on screen results as shown. This data is also recorded to a report file. The report shows the luminance and contrast of box as well as the transverse contrast of box.

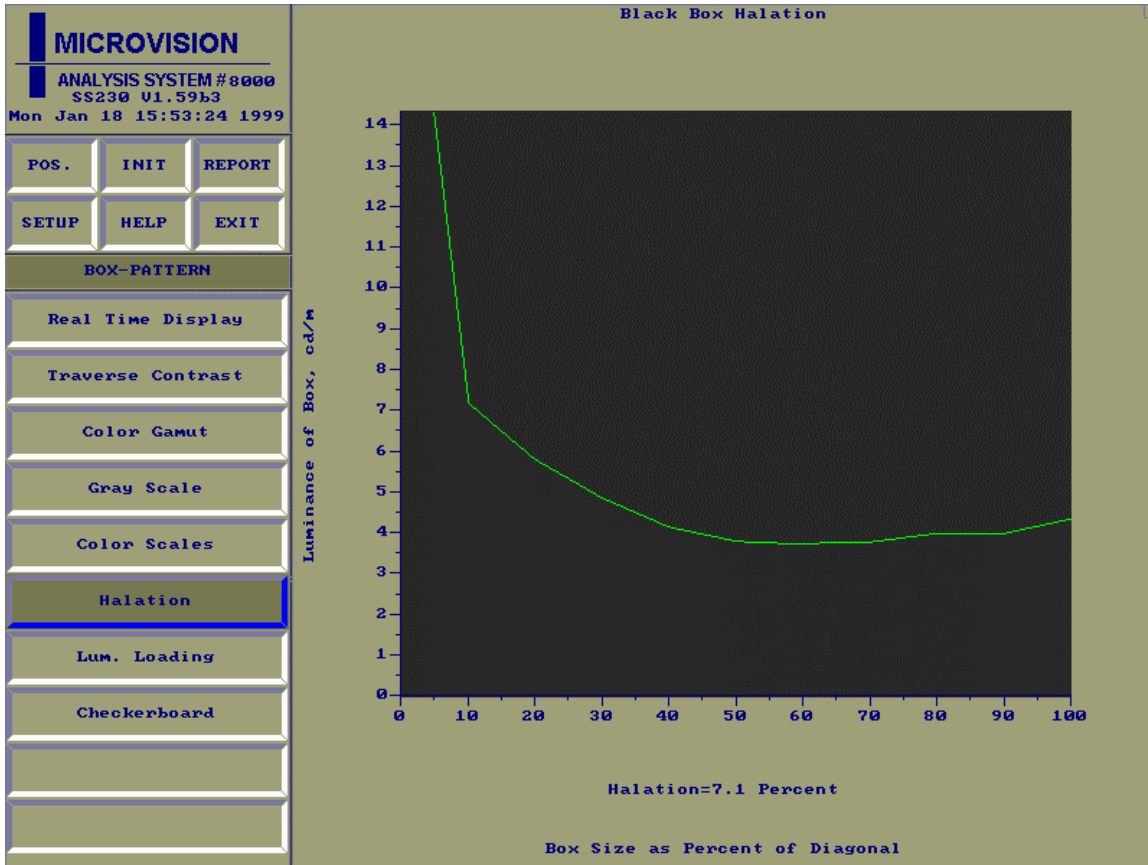
Color Gamut 304-2,5

Gray Scale 304-4

Color Scales 304-6

The **Color Gamut**, **Gray Scale**, and **Color Scales** functions are identical to the to those found in the **Full Screen** function group except that they are performed on a box rather than a full screen. See that section for a screen display.

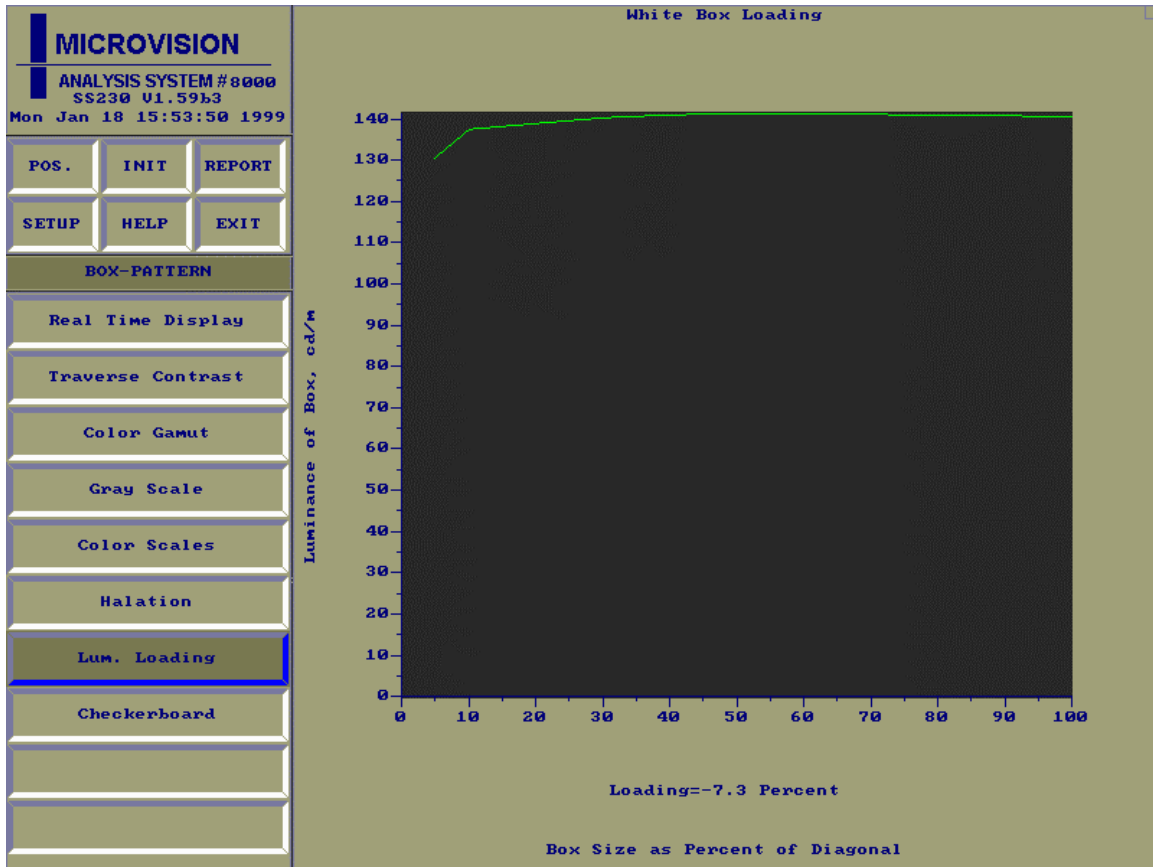
Halation 304-7



The **Halation** function measures the luminance of a black box with a white background as it grows from a small percentage of the screen to full screen size. It determines how much the surrounding white areas corrupts the dark region. The above plot shows the results of this function. The results of are stored in a report file.

Note: Depending on the size of the display being used, it may be necessary to reduce the field of view of the spectrometer lens prior to performing this test by the attachment of an aperture. This will be necessary if the initial size of the box (5% of viewable area) is smaller than 12.5mm (field of view of spectrometer).

Lum. Loading 304-8



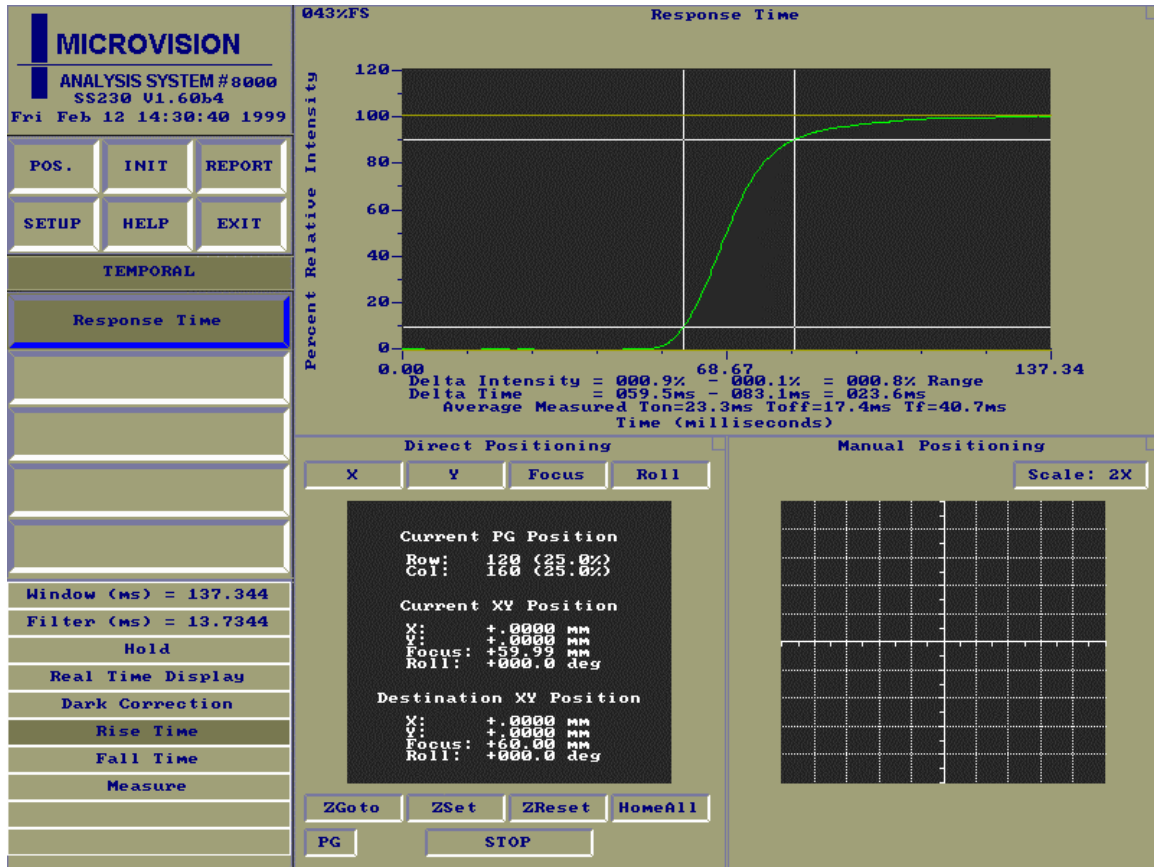
The **Lum. Loading** function measures the luminance of a white box on a black background as it grows from a small percentage of the screen to full screen size. It is a measure of how much the surrounding luminance loading is effecting the centered box. The above screen shows the results of this test.

Note: Depending on the size of the display being used, it may be necessary to reduce the field of view of the spectrometer lens prior to performing this test by the attachment of an aperture. This will be necessary if the initial size of the box (5% of viewable area) is smaller than 12.5mm(field of view of spectrometer).

Checkerboard 304-9

The **Checkerboard** function measures the black and white luminance in the center of a checkerboard pattern and calculate the contrast. The screen clip shows the results that are displayed after the test is run. The results are also saved to a report file.

Temporal 305-1 (Requires OMM [with RTM option] or RTMS Only mode)



The Response Time function measures Ton and Toff of the display. Ton is the time it takes the display to go from a fully off condition to a fully on condition. Toff is the reverse of Ton. The starting and ending threshold percents can be adjusted via the setup function.

Uniformity 306-1:6



The **Uniformity** functions (or nonuniformity) are measurements that determine how well the luminance or color remains constant over the surface of the screen.

9 Point Contrast 306-1:3

```
306-1:3 9 Point Contrast Uniformity
pt CCT Lw Lb Cv x y
1 6236 124. 2.52 49.0 .1979 .4730
2 6324 123. 2.71 45.4 .1978 .4715
3 6474 112. 2.31 48.6 .1976 .4691
6 6261 125. 4.11 30.4 .1983 .4720
5 6290 140. 3.93 35.5 .1976 .4723
4 6172 125. 3.29 37.9 .1977 .4744
7 6166 119. 3.90 30.6 .1974 .4749
8 6202 125. 4.24 29.5 .1981 .4733
9 6299 119. 4.10 29.0 .1986 .4709

Avg 6269 123. 3.45 37.3
Min 6166 112. 2.31 29.0
Max 6474 140. 4.24 29.0
% 4.75 19.8 45.6 .000 Nonuniform

Maximum delta u'v' = .002
```

The **9 Point Contrast** function collects at nine locations the sampled uniformity of white, the uniformity of black, and the uniformity of contrast ratio. The results from the test are shown in the screen clip. This data is also recorded to a report file.

9 Point Color 306-4,5

```
306-4 9 Point Color Uniformity
For Color 0 (R=255,G=000,B=000):
  Avg   Min   Max   Nonuniform %
Lum 36.5 33.5 41.0 18.3
Maximum delta u'v'=.005
For Color 1 (R=000,G=255,B=000):
  Avg   Min   Max   Nonuniform %
Lum 74.2 67.8 84.0 19.2
Maximum delta u'v'=.002
For Color 2 (R=000,G=000,B=255):
  Avg   Min   Max   Nonuniform %
Lum 17.7 15.9 19.8 19.5
Maximum delta u'v'=.010
For Color 3 (R=032,G=032,B=032):
  Avg   Min   Max   Nonuniform %
Lum 8.81 5.85 11.1 47.1
CCT 9999 9999 9999 .000
Gray(5)/F.S. White=10.3/139. (7.4%)
Maximum delta u'v'=.004
```

The **9 Point Color** function collects at nine locations the sampled uniformity of colors and dark gray. The results from the test are shown in the screen clip. This data is also recorded to a report file.

Viewing Angle 307-1



The **View Angle** functions are used to characterize the viewing angle performance of a screen at off-normal angles.

Four-Point 307-1

```
307-1 Four Point Viewing Angle
Position:Up, Angle:15. degrees
White L=133. x=.1983 y=.4740 CCT6159
Black L=3.93 x=.1926 y=.4226 Cr=33.8
Red L=40.3 x=.3939 y=.5179
Green L=81.4 x=.1177 y=.5540
Blue L=19.1 x=.1524 y=.2596
Position:Left, Angle:30. degrees
White L=90.0 x=.1951 y=.4611 CCT7180
Black L=7.57 x=.1898 y=.4448 Cr=11.9
Red L=31.5 x=.3559 y=.5058
Green L=59.3 x=.1221 y=.5431
Blue L=18.2 x=.1610 y=.2806
Position:Down, Angle:10. degrees
White L=135. x=.1985 y=.4730 CCT6197
Black L=3.36 x=.1902 y=.4113 Cr=40.3
Red L=40.5 x=.3976 y=.5187
Green L=82.3 x=.1170 y=.5547
Blue L=19.0 x=.1513 y=.2546
Position:Right, Angle:30. degrees
White L=115. x=.2015 y=.4813 CCT5634
Black L=42.1 x=.1902 y=.4412 Cr=2.73
Red L=62.9 x=.2647 y=.4698
Green L=84.8 x=.1547 y=.4982
Blue L=47.1 x=.1782 y=.4028
```

The **Four-Point** function is used to verify a manufactures claims at four horizontal and vertical viewing angles about the screen. The goniometer will automatically rotate and skew to the required view angles and collect the data. The results from the test are shown in the screen clip. The data is also recorded to a report file.